Are Routine Jobs Moving South? Evidence from Changes in the Occupational Structure of Employment in the U.S. and Mexico*

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January 9, 2019

Abstract

The decline of employment in middle-wage, routine task intensive jobs has been well documented for the United States, and some have argued that this decline is driven, at least in part, by a reallocation of these jobs towards lower income countries, particularly when considering blue collar routine manual jobs. In this paper we compare employment patterns across 100 detailed occupational categories in the U.S. and Mexico. We find that, with few exceptions, routine manual jobs have been on the decline in both countries. This suggests that it is unlikely that the decline observed in the U.S. is due to a reallocation of these jobs to Mexico. Instead, it seems more likely that common shocks, such as the development of routine-replacing automation technologies, are driving the decline of these jobs in both countries.

*We thank Rachel Griffith, James Banks, Matthias Parey, Winston Moore, Martyn Andrews and participants at the Manchester Economics seminars for their comments and suggestions. We are very grateful to Manuel Alejandro Estefan Davila for his support with obtaining and organizing the Mexican data. Cortes thanks the Social Sciences and Humanities Research Council of Canada for support. Email addresses: gmcortes@yorku.ca (Cortes), diego.morris@ntu.ac.uk (Morris).

1 Introduction

Over recent decades, the U.S. labor market has become increasingly polarized, with the share of employment in both high and low wage jobs increasing, while the share of employment in middle-wage jobs has fallen. Some have argued that these disappearing middle-wage jobs, many of which tend to be concentrated in the manufacturing sector, have declined due to globalization: these jobs used to be performed in high-income countries such as the U.S., but have moved to lower-income countries where costs are lower. This argument has gained a lot of political attention. For example, during a presidential debate in 2016, Donald Trump stated that "our jobs are fleeing the country, they are going to Mexico, and many other countries".[1] This movement of routine jobs away from developed countries due to falling trade or offshoring costs is a feature of several important theoretical contributions to the academic literature, such as Antràs et al. (2006), Egger et al. (2015) and Egger et al. (2016). On the other hand, a large body of literature has linked the decline of middle-wage occupations in developed countries to advancements in automation technologies. Pioneering work by Autor et al. (2003) and Goos & Manning (2007) shows that occupations in the middle of the wage distribution in high-income countries tend to involve predominantly routine tasks – tasks that are easily codifiable and therefore particularly susceptible to automation.

These two explanations for the decline in middle-wage jobs in high-income countries have very different implications in terms of the changes in the occupational structure of employment that should be observed in developing countries. On the one hand, if the decline in high-income countries is associated with a movement of these jobs towards lower-income countries, then we would expect the occupations that decline in countries such as the U.S. to be growing in countries such as Mexico. On the other hand, if the main driver of the decline in these jobs is technology, then we would expect these occupations to also be declining in developing countries, perhaps with a time lag if we assume that technology diffusion may take some time. So far, there is very limited evidence on the evolution of the occupational structure of employment in developing countries.

In this paper, we contrast the changes in employment across occupations observed in the U.S. with the patterns observed for Mexico, a middle income country with important commercial ties to the U.S. Trade between the two countries has more than tripled since

[1] https://www.cnbc.com/2016/09/26/trump-lashes-out-against-mexico-china-during-us-president-debate.html

1994, when the North American Free Trade Agreement (NAFTA) was implemented, and exceeded US$550 billion in 2015. At present, Mexico is the United States' third-largest trading partner (after Canada and China).

We use national labor force survey micro-data for both countries. The data includes detailed occupation codes for each individual. We match the occupational categories used in Mexico and in the U.S. based on the job titles associated with each occupation code. This allows us to construct annual employment shares for a set of 100 consistently defined occupational categories which cover all non-agricultural employment in both countries.

We begin by studying the patterns at the level of the four broad occupation groups commonly used in the job polarization literature (e.g. Acemoglu & Autor, 2011) – non-routine cognitive (NRC), routine cognitive (RC), routine manual (RM), and non-routine manual (NRM). In both countries, NRC occupations are the most skill intensive and have the highest average wages; NRM occupations are the least skill intensive and have the lowest average wages, while the routine groups are in the middle of the skill and wage distribution. We find that, between 2000 and 2015, the share of employment in RM occupations declines strongly in both countries. Meanwhile, the share of employment in low-skill NRM occupations features a strong increase in both countries over this time period. The two countries differ in terms of the evolution of high-skill NRC and middle-skill RC occupations. While the U.S. features strong growth in high-paying NRC jobs, employment in these occupations is remarkably stable, if not decreasing, in Mexico. Mexico also features a fairly stable, slightly increasing share of employment in middle-paying RC occupations, in contrast with the declining trend observed in the U.S. These patterns are even more pronounced in border states, which feature a high concentration of export processing plants (*maquiladoras*).

We then turn to a detailed analysis using the 100 occupational categories. Interestingly, although the distribution of wages across job titles could potentially have a very different structure across the two countries, we find that the relative wage ranking of the 100 occupations is remarkably similar across the two countries. We compare the changes in the employment shares of each of these occupations in the U.S. and Mexico between 2003 and 2011 (a period when occupational coding systems remained consistent within each country). We find that employment share changes are positively correlated across the two countries, and particularly so for RM occupations. The vast majority of the RM occupations which feature strong declines

in the U.S. also experience declines in Mexico. Among RC occupations, the correlation in employment share changes across the two countries is much weaker. In particular, sales and administrative support occupations feature strong growth in Mexico, but decline in the U.S.

One might argue that the movement of U.S. jobs to Mexico might occur with some time delay. In order to explore this possibility, we contrast the changes in employment shares observed between 2003 and 2011 in Mexico with those observed between 1994 and 2002 in the U.S. We find that most of the RM occupations that experienced strong contractions in employment shares between 1994 and 2002 in the U.S. also contract in Mexico between 2003 and 2011.

Overall, we do not find strong evidence that the routine jobs that have been declining in the U.S. have been growing in Mexico. The vast majority of the routine occupations that are declining in the U.S. are also declining or remain relatively stable in Mexico. The main exceptions relate to sales and administrative support occupations. Hence, even though blue-collar manufacturing jobs are often claimed to be increasingly moving to countries such as Mexico, the empirical evidence suggests that this focus is for the most part misplaced. Instead, the fact that these types of jobs are declining in both countries suggests that the patterns are more likely driven by common shocks that affect both countries, such as the development of new technologies that can replace for workers in these tasks, as suggested by Autor et al. (2003).

Our paper contributes to several strands of the literature. It adds to the large and growing literature on the disappearance of routine jobs by providing evidence on the decline in routine employment in Mexico. So far, the evidence for de-routinization outside of high-income countries is quite limited. Recent notable contributions that consider these patterns for developing countries include Ariza & Raymond Bara (2018); World Bank (2016) and Reijnders & de Vries (2018). The key innovation of our paper is to provide an analysis at a much finer occupational level, rather than considering only the patterns across broad occupational groups, and to contrast the patterns observed in a developing country to those observed in the U.S.

We also contribute to the literature that analyzes the impacts of offshoring and trade on the labor market. This literature has primarily focused on how globalization impacts the skill premium (e.g. Acemoglu et al., 2015; Burstein & Vogel, 2017; Goldberg & Pavcnik, 2007; Grossman & Rossi-Hansberg, 2008; Hummels et al., 2018). Autor et al. (2013) and Autor et al. (2014) analyze the impact of rising import competition from China on employment outcomes across local labor markets and individuals in the

U.S. Rather than exploiting a specific shock, our paper investigates the evidence for the basic underlying idea that certain jobs are moving to developing countries over time as overall trade and offshoring costs are declining. At the same time, our analysis provides a unique and new approach to address the question of the role of trade and outsourcing relative to technology in driving changes in the occupational structure of employment in the U.S. (Autor et al., 2015; Goos et al., 2014). Finally, we contribute to the literature analyzing the impacts of trade on the Mexican labor market (Iacovone et al., 2013; Mendez, 2015; Utar & Torres Ruiz, 2013).

2 Data

We use national Labor Force Survey data from Mexico and the United States. In the case of Mexico, we use the National Employment Survey (*Encuesta Nacional de Empleo*, ENE) and its successor, the National Survey of Occupations and Employment (*Encuesta Nacional de Ocupación y Empleo*, ENOE). The ENE provides national coverage since the year 2000.[2] These surveys are administered at a quarterly frequency by Mexico's National Statistical Agency (INEGI). We use publicly available data from these surveys up until the year 2015.[3]

For the United States, we use data from the Current Population Survey (CPS), the primary source for the country's labor force statistics. The CPS is conducted at a monthly frequency and is sponsored jointly by the U.S. Census Bureau and the U.S. Bureau of Labor Statistics (BLS). We use the version of the data made publicly available by IPUMS (Ruggles et al., 2018).

In both countries, we focus on workers aged between 16 and 65 who are not in the military and who have non-missing information on their current occupation. For consistency with the literature, we also exclude workers in agriculture and farming occupations.[4] Our Mexican sample contains around 594,000 observations per year, while the U.S. sample contains around 730,000 observations per year. As in many

[2]Earlier waves of the survey, originally called the National Survey of Urban Employment (*Encuesta Nacional de Empleo Urbano*, ENEU), were limited to a sample of cities.

[3]For 2005, only the second quarter of data is publicly available, so in order to minimize the effect of any seasonal variations between this and other years, we omit 2005 from our analysis.

[4]Occupation is never missing for any of our observations in the U.S. In Mexico, occupation is missing for less than 0.03% of observations per year. Less than 1.4% of workers in our U.S. sample are employed in agriculture or farming occupations between 2000 and 2015. In Mexico, the proportion ranges from 13.2% in 2000 to 10.7% in 2015.

other developing countries, Mexico has a large informal sector.[5] However, occupational information is reported for all workers, including those in the informal sector, so we are able to include informal workers in our analysis.

Summary statistics are presented in Table 1. In both countries, the workforce is aging over time and the fraction of female workers is increasing, though both the average age and the fraction of female workers are higher in the U.S. than in Mexico. The share of employment in the manufacturing sector is higher in Mexico than in the U.S., but it falls by roughly the same amount (around 5 p.p.) in both countries between 2000 and 2015. Average real wages are around ten times higher in the U.S. than in Mexico.[6] There are also substantial differences between the two countries in their workforce's educational composition. Educational attainment is much higher in the U.S., which has nearly twice the proportion of college graduates. Attainment shows rapid improvement over time in Mexico, though, with the proportion of workers with elementary education or less falling nearly by half between 2000 and 2015. In spite of these dramatic differences in workforce composition, we show in the following section that the evolution of the occupational employment structure is remarkably similar in the two countries.

Matching Occupation Codes

The main challenge when trying to compare changes in employment at the occupational level across countries is the fact that different countries use different occupational coding systems, and these coding systems also change for a given country over time. In the case of Mexico, occupations are coded using the *Clasificación Mexicana de Ocupaciones* (CMO) from 2000 to mid-2012, and the *Sistema Nacional de Clasificación de Ocupaciones* (SINCO) from mid-2012 onwards. In the U.S. the 1990 Census Occupation Coding (COC) system is used in the CPS until 2002. From

[5] Around 30% of employees in our sample are in the informal sector, defined as workers who are not registered with the Mexican Social Security Institute (IMSS), as in Leal Ordóñez (2014).

[6] Wages in the U.S. are based on hourly wages, when available, or weekly earnings divided by usual (or actual) hours worked per week. As in Lemieux (2006), top-coded earnings are adjusted by a factor of 1.4. We convert nominal values to 2009 dollars based on the monthly Consumer Price Index (CPI, All Urban Consumers) from the BLS. Wages in Mexico are based on the earnings per hour variable available in the datasets. Nominal values are converted to 2009 pesos based on annual CPI data from the IMF World Economic Outlook April 2018 Database. Values in 2009 pesos are converted to 2009 U.S. dollars based on the average daily exchange rate for 2009 reported by Banco de México. We do not adjust for Purchasing Power Parity, so the difference in wage levels between the two countries partly reflects differences in living costs.

2003 to 2010, occupations are coded using the 2000 COC system, while the 2010 COC system is used from 2011 onwards. The U.S. occupation codes have been harmonized over time by Autor & Dorn (2013) using consistent "occ1990dd" codes.

In spite of the differences across countries and over time, it is possible to match occupations across different coding systems based on job titles. For example, there are specific occupation codes for "accountants and auditors" in all coding systems. For the purposes of our analysis, our approach is to map the U.S. and the Mexican codes to a new harmonized coding system. We match codes from the two countries' systems based on job titles. In some cases, we can make exact matches (as in the case of "accountants and auditors"), while in other cases we need to generate categories that are somewhat more aggregated (e.g. "engineers and scientists"). Full details of the crosswalk to our new coding system, which we denote as "occ_cm" in what follows, are provided in Appendix Table A.1. Our proposed system consists of 100 harmonized codes covering all non-agricultural occupations in both countries.

Below we provide a detailed analysis and comparison of the employment structure in the two countries across these 100 occupational categories, along with a range of descriptive statistics. Before doing so, we begin with an analysis that aggregates these 100 detailed occupations into the four broad occupations groups commonly used in the literature on job polarization (e.g. Acemoglu & Autor, 2011). These four groups are:

1. Managers, Directors, Professionals, Technicians – high-skill, high-wage occupations, intensive in Non-Routine Cognitive (NRC) tasks

2. Clerical, Administrative and Sales – middle-skill, middle-wage occupations, intensive in Routine Cognitive (RC) tasks

3. Production, Crafts, Repair, Machine Operators and Drivers – middle-skill, middle-wage occupations, intensive in Routine Manual (RM) tasks

4. Janitors, Security Services, Caring Services and Other Services – low-skill, low-wage occupations, intensive in Non-Routine Manual (NRM) tasks

Appendix Table A.2 shows how we map our harmonized occ_cm codes to these four broad categories. The assignment of task labels to these occupation groups is commonly done in the literature, and is supported by characterizations of task content obtained from the US Dictionary of Occupational Titles, and its successor O*Net. Acemoglu & Autor (2011) argue that the use of these four broad occupational categories maximizes

transparency while mapping logically to broad task clusters. For simplicity, we use these same task labels as a shorthand way to refer to the four occupation groups in our context.

We are not aware of any dataset that provides information on the task content of occupations in the Mexican context. However, although the task content of occupations may differ substantially between countries, we expect the relative task ranking across these four broad groups to be similar in Mexico and in the U.S. For example, even though clerical and production workers in Mexico may perform very different tasks than their U.S. counterparts, we would expect that these workers would still be the ones that are performing routine tasks relatively more intensively in their respective countries, as compared to other workers such as managers or personal service workers. Hence, we believe the task content labels to be appropriate for the four groups in this context.[7]

The four occupational clusters have been shown to follow a clear ranking in terms of skill intensity and wage levels in the U.S. (see Acemoglu & Autor (2011) and the large literature on job polarization). In Figure 1 we show that these four broad clusters also follow the same pattern in Mexico. The panel on the left shows mean log hourly wages by occupation group for the year 2000, while the panel on the right shows the fraction of workers who have a college degree. It is clear from this figure that, as in the U.S., wage levels are highest amongst workers in the non-routine cognitive category, and lowest amongst those in the non-routine manual category. Levels of education are also noticeably higher in cognitive occupations as compared to manual ones.[8]

[7] See also Bhalotra & Fernandez (2018) who perform a similar grouping of occupations using Mexican data.

[8] A caveat of our wage analysis is that the non-response rate to the earnings question in Mexico is relatively high, as pointed out by Campos-Vazquez & Lustig (2017). In 2003, 10.6% of our sample has missing earnings data. The missing data problem is particularly severe for higher paying occupations. In 2003, the proportion of missing earnings data is 18.7% among NRC workers, 10.6% among RC, 7.5% among RM, and 7.4% among NRM workers. Although this raises questions about our estimates of the wage *levels* in each occupation, we would not expect this to have an impact on the *relative ranking* of occupations within the country's wage distribution, which is our main object of interest.

3 Main Results

3.1 Employment Patterns across Broad Occupational Groups

We begin by considering the overall patterns in employment shares across the four broad occupation groups described above. Figure 2 reproduces the well-known patterns regarding the evolution of the occupational employment structure in the U.S. Panel A presents the patterns over the 1985–2000 period. As has been well documented, this is a period that features very strong growth in high-skill non-routine cognitive (NRC) occupations. This period also features a strong decline in middle-wage routine employment, with the sharpest decline observed for routine manual (RM) occupations, and smaller declines for routine cognitive (RC) occupations. The share of employment in non-routine manual (NRM) occupations remains relatively stable.

In Panel B we plot the changes over the period 2000–2015. During this period, there is strong growth in low-skill NRM occupations, while the share of employment in high-skill NRC occupations also continues to grow strongly. At the same time, the marked decline in both types of middle-wage routine employment shares continues during this period.[9]

Figure 3 depicts the analogous patterns observed over the 2000–2015 period in Mexico. There are two strong similarities with the U.S.: In both countries, the share of employment in middle-skill RM occupations declines strongly over the time period, while in both countries the share of employment in low-skill NRM occupations features a strong increase. The magnitudes are also similar. The employment share of RM jobs falls by 4.6 p.p. in Mexico and by 4.9 p.p. in the U.S., while the employment share of NRM jobs increases by 4.9 p.p. and 3.3 p.p. in Mexico and the U.S., respectively.

The two countries differ, however, in terms of the evolution of high-skill NRC and middle-skill RC occupations. While the U.S. features strong growth in high-paying NRC jobs, employment in these occupations is stable, if not decreasing, in Mexico. Mexico also features a fairly stable, slightly increasing share of employment in middle-paying

[9]Note that there is a discontinuity in the U.S. employment shares between the years 2002 and 2003. This is due to the change in the underlying occupation codes, which are based on the 1990 Census Code system up until 2002, and on the 2000 system from 2003 onwards. Even though the codes have been converted to the harmonized occ1990dd codes, discontinuities still arise at the time when the underlying codes change. These discontinuities, however, do not affect the broad trends of interest. In later sections, we restrict our sample to the post-2003 period in order to avoid issues related to these discontinuities.

RC occupations, in contrast with the declining trend observed in the U.S.[10]

On the face of it, these results suggest that it does not seem to be the case that the decline of employment in middle-skill RM occupations in the U.S. has been associated with a movement of these jobs to Mexico. One might argue, however, that the movement of U.S. jobs to Mexico would not be observed in Mexico at a national scale, but would rather be concentrated in certain geographical regions, in particular in the states that border the U.S. A high fraction of firms in these states import inputs mostly from the U.S., process them, and then ship them back to the origin country. These firms are known as *maquiladoras*. The maquiladora program started in 1965 with the purpose of reducing unemployment in the border region, and permits tariff-free transaction of the inputs and the machinery between a maquiladora plant and the foreign companies, while also allowing 100% foreign ownership.

Utar & Torres Ruiz (2013) argue that since its introduction, the maquiladora industry moved from consisting only of low-skilled labor-intensive plants focusing on simple assembly jobs towards more advanced manufacturing processes, such as the production of machinery and automobiles. They point out that in 2006 the maquiladora industry in Mexico generated more than 25 billion dollars in foreign exchange, and accounted for 44% of total Mexican manufacturing exports. 94% of the maquiladora exports in that year went to the U.S.

Although maquiladoras can now be established anywhere in Mexico, their high concentration in border states make these of particular interest to study occupational employment patterns. We therefore split the sample according to geographic proximity to the U.S. In the left panel of Figure 4 we plot the changes in the employment shares for the six states that are adjacent to the U.S. border (Baja California, Sonora, Chihuahua, Coahuila, Nuevo León, and Tamaulipas), while the right panel plots the patterns for the remaining 26 states. The figure shows that the patterns discussed above at the national level are even more pronounced in border states. The fact that RM employment shares are declining very strongly in border states further raises questions about the plausibility of American RM jobs being moved to Mexico.

Figure 5 shows the detailed patterns by state. The loss of routine manual employment, and the growth of non-routine manual employment is pervasive, occurring in all 31 states and in Mexico City. The direction of change in the

[10]In Mexico, a slight discontinuity appears between the years 2011 and 2013, the period during which the occupation coding system switches from CMO to SINCO. In later sections, we restrict our sample to the period up to 2011 in order to avoid issues related to these discontinuities.

employment share of cognitive occupations is more heterogeneous across states.

To summarize, our findings show that in Mexico, as in many high-income countries, the share of workers in middle-skill RM occupations has fallen substantially, with a compensating increase in low-skill NRM occupations. The main difference observed for Mexico relative to the patterns observed for the U.S. and other high-income countries is that the employment share in high-skill NRC occupations has not increased in Mexico.

3.2 Employment Patterns across Detailed Occupational Groups

The patterns documented in the previous section may hide important differences between the changes in the occupational structure of employment in the U.S. and Mexico. For example, it may be the case that even though RM occupations as a whole are shrinking in both countries, certain types of RM jobs are shrinking in the U.S. but growing in Mexico.

In this section we explore the employment patterns in the two countries at a more detailed level of aggregation. We restrict our analysis to the period 2003–2011. This is a period during which the underlying occupation coding system remains consistent within each country, and hence allows us to more reliably measure changes in employment shares within a country over time, without any issues of discontinuities induced by changes in coding systems (see footnotes 9 and 10).

We begin by focusing on the 12 sub-categories of employment detailed in Appendix Table A.2. Panel A of Figure 6 shows the well-established U-shaped pattern of changes in occupational employment shares for the U.S. The three occupational categories on the left of the figure are all NRM occupations involving personal services. These are the three groups with the lowest median wages in 2003 (both in the U.S. and in Mexico). The following four categories – transportation, machine operators, production and construction occupations, and mechanics and repairers – are RM occupations; the following two – administrative support and sales – are RC. These six groups are in the middle of the occupational wage distribution in both countries. Finally, the three rightmost occupational categories correspond to the high-paying NRC occupations – technicians, management, and professionals. The figure shows that low-paying NRM and high-paying NRC occupations have grown, while middle-paying RM and RC occupations have experienced a reduction in their employment share in the U.S. between 2003 and 2011.

Panel B shows the corresponding patterns for Mexico. All three NRM categories grow in Mexico, as they do in the U.S. The four groups of middle-paying RM occupations all shrink in Mexico, as they also do in the U.S. The main differences between the two countries arise towards the top of the occupational wage distribution. While both groups of RC occupations – administrative support and sales – experience declines in their employment shares in the U.S., we only observe a slight decline in sales, and some growth in administrative support occupations in Mexico. Two of the three high-paying NRC occupations grow in Mexico, as they do in the U.S. However, the increase in the employment share of professional specialty occupations is much more modest in Mexico, as compared to the U.S. Moreover, management-related occupations are declining in Mexico, even though they grow in the U.S.

We now turn to an analysis at the level of the 100 detailed harmonized occupations for the U.S. and Mexico that we have created ("occ_cm"). As mentioned above, our mapping is based on the job titles used in the U.S. and Mexican occupational coding systems.

We begin by considering the distribution of wages across these 100 occupations in the two countries. Naturally, these distributions do not necessarily have to be similar across the two countries. They will be influenced by local factors affecting demand and supply for different types of jobs. In order to explore the extent to which the two distributions differ, we compare the relative ranking of our 100 occ_cm occupations within each country's occupational wage distribution in Figure 7. Panel A plots each occupation's median log wage in the U.S. against its median log wage in Mexico. This is done for the year 2003, and wages for both countries are in constant 2009 U.S. dollars. Each circle represents one of our 100 occupations, with the size of the circle corresponding to the average of the occupation's share of aggregate employment in the U.S. and Mexico. The color of each circle indicates the broad occupational group that the occupation belongs to (with blue corresponding to NRC, red to RC, green to RM and orange to NRM).

Remarkably, even though the wage *levels* are very different in the U.S. and Mexico (as indicated by the different range of the two axes), there is a strong correlation between the median occupational wages in the two countries; in other words, occupations that are relatively high paying in one country tend to also be towards the top of the distribution in the other country. Panel B further illustrates this by plotting each occupation's (unweighted) ranking in the corresponding country, with 1 being the lowest paying occupation and 100 corresponding to the highest paying

occupation in each country. The correlation is strong (correlation coefficient of 0.79). Moreover, in both countries, NRC occupations tend to be at the top of the distribution. Among the other three broad occupation groups, there is more heterogeneity. RC and RM occupations tend to show quite a bit of overlap with each other in both countries. However, in the U.S., they tend to be concentrated towards the middle of the distribution, with NRM occupations occupying the lower ranks. In Mexico there is more overlap between the three groups, with some RC and RM occupations being further towards the bottom of the wage distribution in Mexico as compared to the U.S.[11]

Returning to our main question, we are interested in determining whether occupations that are shrinking in the U.S. – and in particular RM occupations – are growing in Mexico. Figure 8 plots the change in the employment share of each of the 100 occupations in the U.S. on the y-axis, and in Mexico on the x-axis, over the period 2003–2011. The markers once again distinguish which broad occupational category each occupation corresponds to, with blue circles for NRC, red triangles for RC, green diamonds for RM and orange squares for NRM.

Figure 8 shows a positive correlation in terms of changes in employment shares in the two countries between 2003 and 2011. Nearly half of the 100 occupations are either in the bottom left quadrant (shrinking in both countries) or in the top right quadrant (growing in both countries). Table 2 presents detailed patterns for the occupations with the largest increases and decreases in employment shares in the U.S. Out of the 12 occupations that experience the largest contractions in employment shares in the U.S., all except "production, installation and maintenance laborers" (occ_cm code 75) contract in Mexico as well. Meanwhile, out of the 12 occupations that experience the largest growth in employment shares in the U.S., all except "managers and administrators n.e.c." (occ_cm code 39) grow in Mexico as well.

Notably, many of the RM occupations which feature strong declines in the U.S. also experience declines in Mexico. In fact, the correlation in employment share changes in Figure 8 is strongest among RM occupations, with a correlation coefficient of 0.70. For example, as shown in Table 2, "production-related occupations" (occ_cm code 74) decline by 0.46 p.p. in the U.S. and by 0.97 p.p. in Mexico. "Other machine

[11]Appendix Table A.3 identifies occupations that have substantially different rankings (over 25 positions apart) in the two countries. Sales-related occupations (except financial sales) stand out as being much higher in the U.S. occupational wage distribution than in the Mexican one. Several RM occupations are also much higher in the distribution in the U.S. than in Mexico. In Mexico, sport and arts-related occupations are relatively very highly remunerated.

operators" (occ_cm code 85), "winding and twisting textile and apparel operatives" (occ_cm code 77), "carpenters" (occ_cm code 65) and "transportation and material moving occupations" (occ_cm code 86) also feature important declines in both countries. The main exception among RM occupations is "production, installation and maintenance laborers" (occ_cm code 75), which declines by 0.19 p.p. in U.S. but increases by 0.07 p.p. in Mexico.

Among RC occupations, there are two notable occupations that feature very strong growth in Mexico while declining in the U.S. – the two red triangles at the far right of Figure 8. These occupations are "salespersons n.e.c." (occ_cm code 50), which grow by 1.05 p.p. in Mexico and shrink by 0.15 p.p. in the U.S., and "other administrative support occupations n.e.c." (occ_cm code 60), which grow by 0.96 p.p. in Mexico and shrink by 0.05 p.p. in the U.S.

One might argue that the disappearing middle-wage jobs in the U.S. are only slowly moving to Mexico and that, by comparing the 2003–2011 period in both countries one might miss some of this offshoring process. In order to explore this possibility, in Figure 9 we once again plot changes in employment shares in the two countries against each other, but we now consider the period 1994–2002 for the U.S. (on the y-axis), while still focusing on the period 2003–2011 for Mexico (on the x-axis). This analysis would capture whether any employment losses in the U.S. occurring during the first 8 years of the NAFTA agreement resulted in higher future employment growth in Mexico in later years.[12]

The figure shows that most of the RM occupations that experienced strong contractions in employment shares between 1994 and 2002 in the U.S. also contract in Mexico between 2003 and 2011. The main exception is once again "production, installation and maintenance laborers" (occ_cm code 75), which declines by 0.52 p.p. in the U.S. between 1994 and 2002, but increases by 0.70 p.p. in Mexico between 2003 and 2011.

Discussion

To summarize, we do not find strong evidence that the routine jobs that have been declining in the U.S. have been growing in Mexico. The vast majority of routine occupations that are declining in the U.S. are also declining or remaining relatively

[12]Note that the U.S. CPS consistently uses 1990 Census Occupation codes over the period 1994–2002 that we are considering, so there would be no concerns with employment changes capturing discontinuities in underlying occupational codes during this time period.

stable in Mexico. The main exceptions relate to sales and administrative support occupations. Hence, even though blue-collar manufacturing jobs are often claimed to be increasingly offshored to countries such as Mexico, the empirical evidence shows that this focus is for the most part misplaced. The fact that most of these types of jobs are declining in both countries suggests that common shocks that affect employment in these occupational categories in both countries are a more likely explanation for the observed employment patterns. One natural explanation would be the development of new technologies that can replace for labor in these tasks, as suggested by Autor et al. (2003) and the subsequent literature on job polarization.

4 Conclusions

The U.S. labor market has become increasingly polarized, with the share of employment in both high and low wage jobs increasing, while the share of employment in middle-wage jobs has fallen. Some have argued that these declining middle-wage jobs have been moving to developing countries such as Mexico. In this paper we explore whether there is any evidence in favor of this type of argument. We do this by contrasting the observed changes in employment shares across detailed occupational categories in the U.S. and in Mexico.

We find that most of the middle-skill routine manual occupations which feature strong declines in the U.S. also experience declines in Mexico. The employment share of production workers, machine operators, and textile and apparel operatives, for example, decline strongly in both countries.

Overall, our results show little to no evidence to support the argument that the decline of employment in middle-skill routine manual occupations in the U.S. has been associated with a movement of these jobs to Mexico. Instead, the results suggest that shocks that affect employment in these occupations in both countries, such as technological change in the form of new automation technologies that replace for workers in routine manual tasks, are more likely to be driving the observed changes in the occupational structure of employment in both countries.

References

Acemoglu, D. & Autor, D. (2011). Skills, Tasks and Technologies: Implications for Employment and Earnings. *Handbook of Labor Economics*, 4, 1043–1171.

Acemoglu, D., Gancia, G., & Zilibotti, F. (2015). Offshoring and Directed Technical Change. *American Economic Journal: Macroeconomics*, 7(3), 84–122.

Antràs, P., Garicano, L., & Rossi-Hansberg, E. (2006). Offshoring in a Knowledge Economy. *The Quarterly Journal of Economics*, 121(1), 31–77.

Ariza, J. & Raymond Bara, J. L. (2018). Technical Change and Employment in Brazil, Colombia, and Mexico. Who Are The Most Affected Workers? *International Labour Review*.

Autor, D. H. & Dorn, D. (2013). The Growth of Low Skill Service Jobs and the Polarization of the U.S. Labor Market. *American Economic Review*, 103(5), 1553–1597.

Autor, D. H., Dorn, D., & Hanson, G. H. (2013). The china syndrome: Local labor market effects of import competition in the united states. *American Economic Review*, 103(6), 2121–68.

Autor, D. H., Dorn, D., & Hanson, G. H. (2015). Untangling Trade and Technology: Evidence from Local Labour Markets. *Economic Journal*, 125(584), 621–46.

Autor, D. H., Dorn, D., Hanson, G. H., & Song, J. (2014). Trade Adjustment: Worker-Level Evidence. *Quarterly Journal of Economics*, 129(4).

Autor, D. H., Levy, F., & Murnane, R. J. (2003). The Skill Content of Recent Technological Change: An Empirical Exploration. *Quarterly Journal of Economics*, 118, 4.

Bhalotra, S. R. & Fernandez, M. (2018). Women's labor force participation and the distribution of the gender wage gap. *Working Paper, University of Essex*.

Burstein, A. & Vogel, J. (2017). International trade, technology, and the skill premium. *Journal of Political Economy*, 125(5), 1356–1412.

Campos-Vazquez, R. M. & Lustig, N. (2017). *Labour income inequality in Mexico: Puzzles solved and unsolved*. Technical report, World Institute for Development Economic Research (UNU-WIDER).

Egger, H., Kreickemeier, U., Moser, C., & Wrona, J. (2016). Offshoring and job polarisation between firms. *CEPIE Working Paper, No. 08/16*.

Egger, H., Kreickemeier, U., & Wrona, J. (2015). Offshoring domestic jobs. *Journal of International Economics*, 97(1), 112–125.

Goldberg, P. K. & Pavcnik, N. (2007). Distributional effects of globalization in developing countries. *Journal of Economic Literature*, 45(1), 39–82.

Goos, M. & Manning, A. (2007). Lousy and Lovely Jobs: The Rising Polarization of Work in Britain. *The Review of Economics and Statistics*, 89(1), 118–133.

Goos, M., Manning, A., & Salomons, A. (2014). Explaining Job Polarization: Routine-Biased Technological Change and Offshoring. *The American Economic Review*, 104(8), 2509–2526.

Grossman, G. M. & Rossi-Hansberg, E. (2008). Trading Tasks: A Simple Theory of Offshoring. *The American Economic Review*, 98(5), 1978–1997.

Hummels, D., Munch, J. R., & Xiang, C. (2018). Offshoring and labor markets. *Journal of Economic Literature*, 56(3), 981–1028.

Iacovone, L., Rauch, F., & Winters, L. A. (2013). Trade as an Engine of Creative Destruction: Mexican Experience with Chinese Competition. *Journal of International Economics*, 89(2), 379–392.

Leal Ordóñez, J. C. (2014). Tax collection, the informal sector, and productivity. *Review of Economic Dynamics*, 17(2), 262–286.

Lemieux, T. (2006). Increasing residual wage inequality: Composition effects, noisy data, or rising demand for skill? *The American Economic Review*, (pp. 461–498).

Mendez, O. (2015). The Effect of Chinese Import Competition on Mexican Local Labor Markets. *The North American Journal of Economics and Finance*, 34, 364–380.

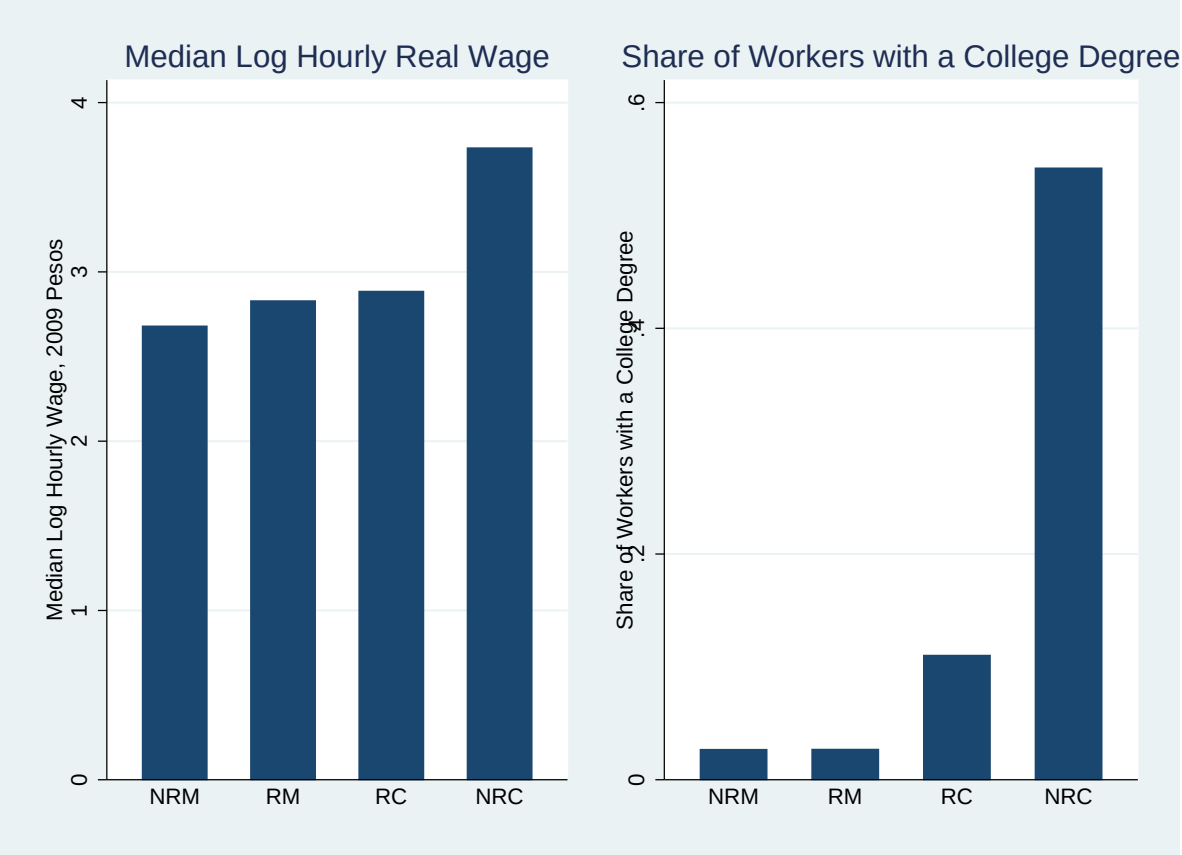
Reijnders, L. S. & de Vries, G. J. (2018). Technology, Offshoring and The Rise of Non-Routine Jobs. *Journal of Development Economics*.

Ruggles, S., Flood, S., Goeken, R., Grover, J., Meyer, E., Pacas, J., , & Sobek, M. (2018). Integrated Public Use Microdata Series (IPUMS) USA: Version 8.0.

Utar, H. & Torres Ruiz, L. B. (2013). International Competition and Industrial Evolution: Evidence from the Impact of Chinese Competition on Mexican Maquiladoras. *Journal of Development Economics*, 105, 267–287.

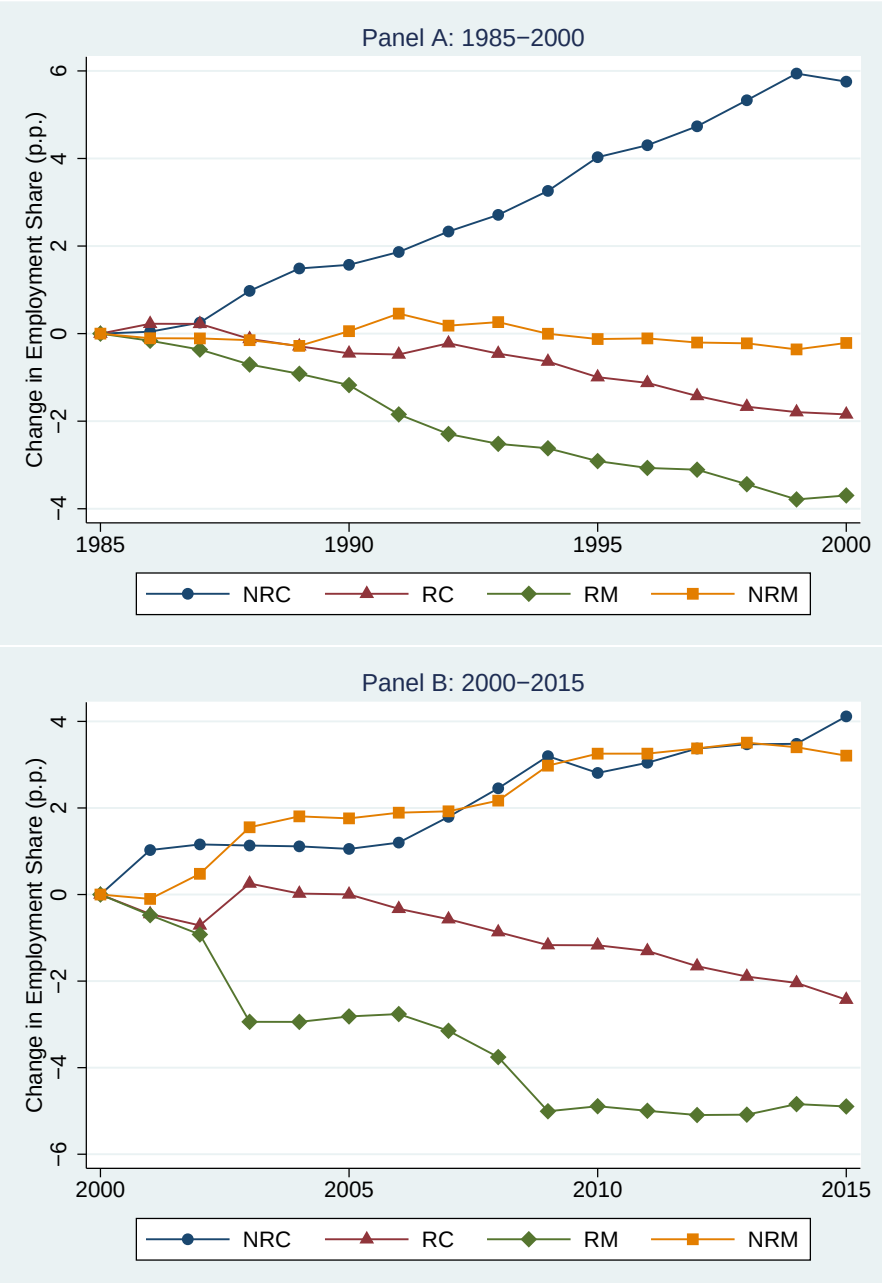
World Bank (2016). *World Development Report 2016: Digital Dividends*. Washington, Washington DC: World Bank.

Figure 1: Wage and Education Levels across Major Occupation Groups in 2000, Mexico



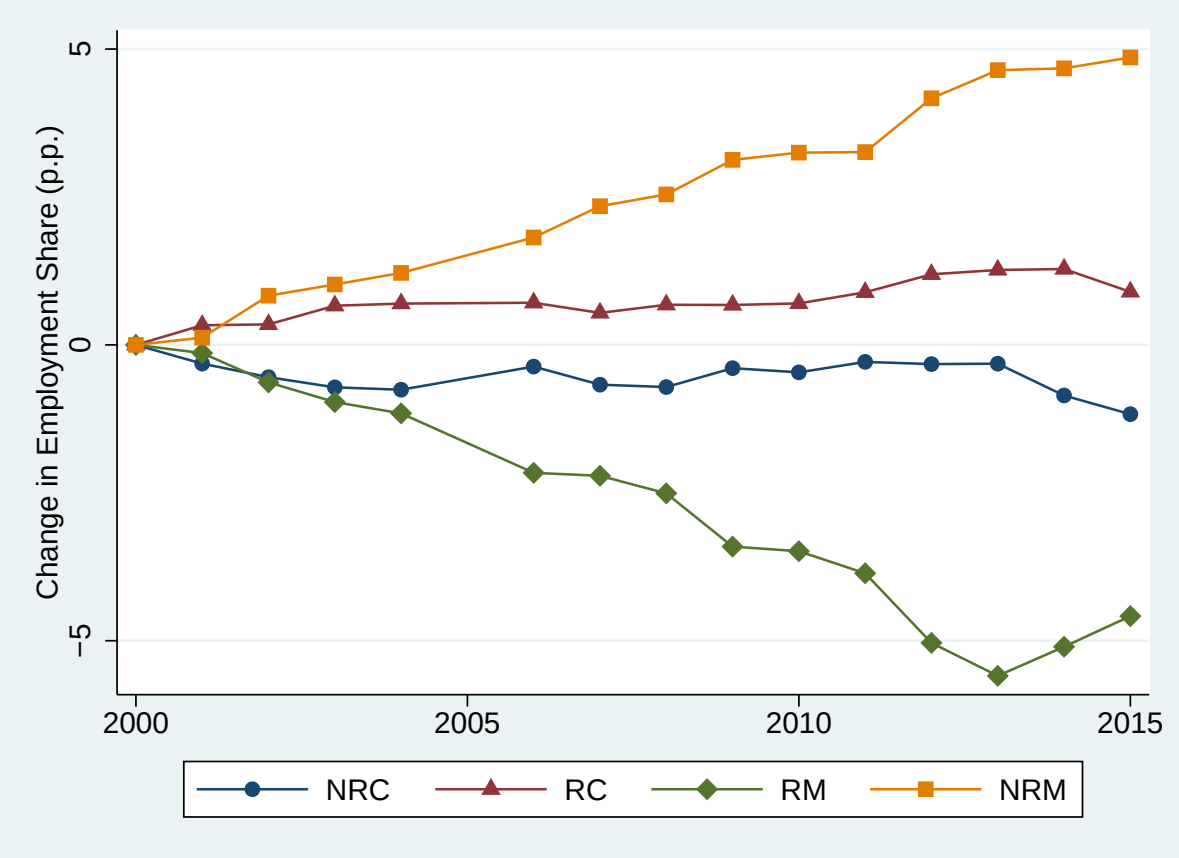
Note: Figures based on Mexican ENEU and ENOE data

Figure 2: Changes in Employment Shares by Major Occupation Groups, United States



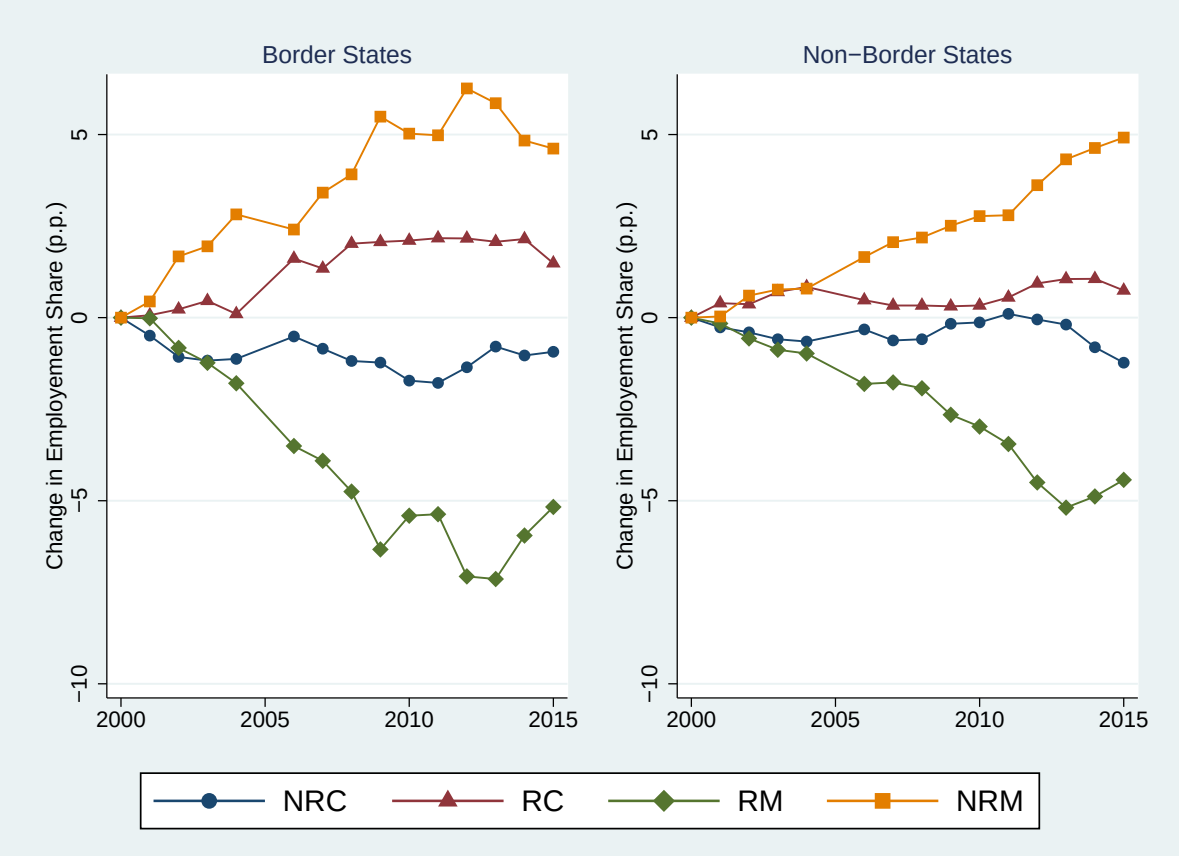
Note: Change in employment shares relative to 1985 (Panel A) and relative to 2000 (Panel B) based on US CPS data. NRC stands for non-routine cognitive, RC for routine cognitive, RM for routine manual, and NRM for non-routine manual.

Figure 3: Changes in Employment Shares by Major Occupation Groups, Mexico



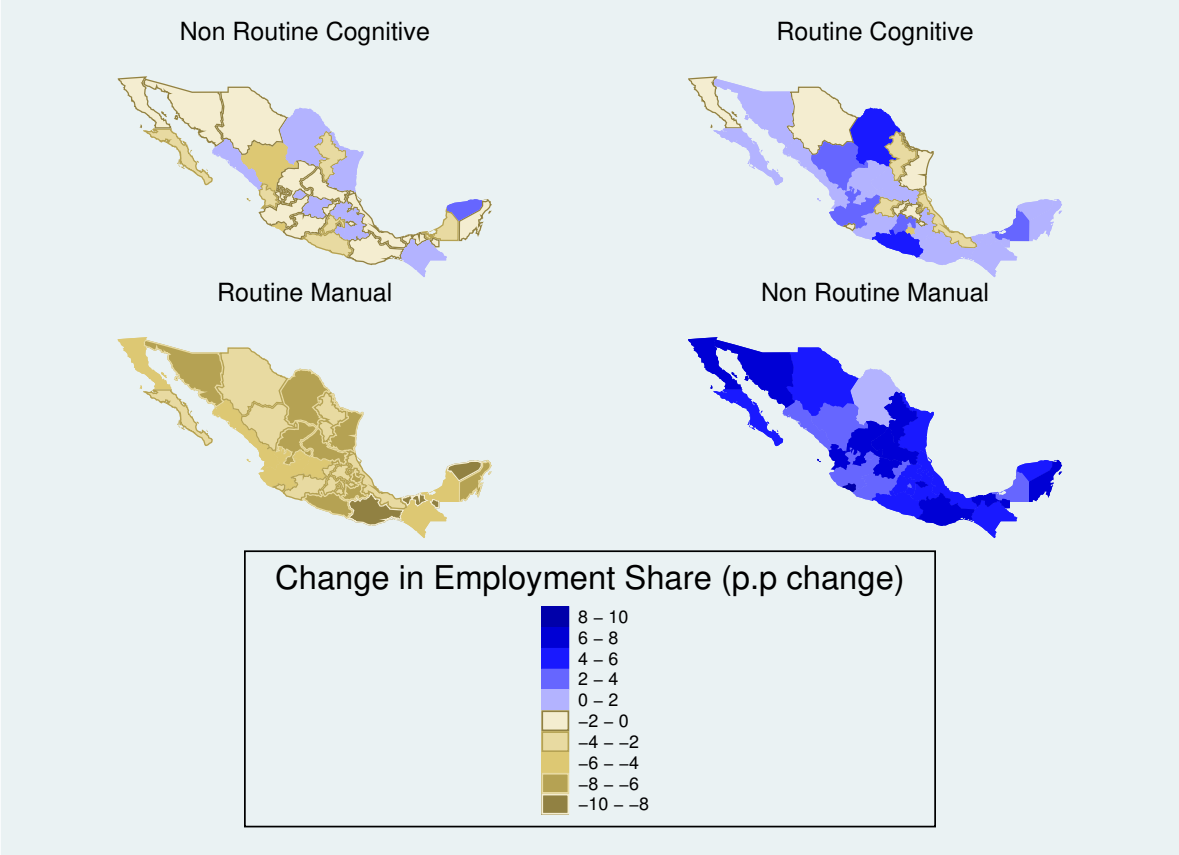
Note: Change in employment shares relative to 2000 based on Mexican ENEU and ENOE data. NRC stands for non-routine cognitive, RC for routine cognitive, RM for routine manual, and NRM for non-routine manual.

Figure 4: Changes in Employment Shares in Mexico, by Proximity to the U.S.



Note: Change in employment shares relative to 2000 based on Mexican ENEU and ENOE data. NRC stands for non-routine cognitive, RC for routine cognitive, RM for routine manual, and NRM for non-routine manual. Border states are Baja California, Sonora, Chihuahua, Coahuila, Nuevo León, and Tamaulipas.

Figure 5: Changes in occupational composition across Mexican states, 2000–2015

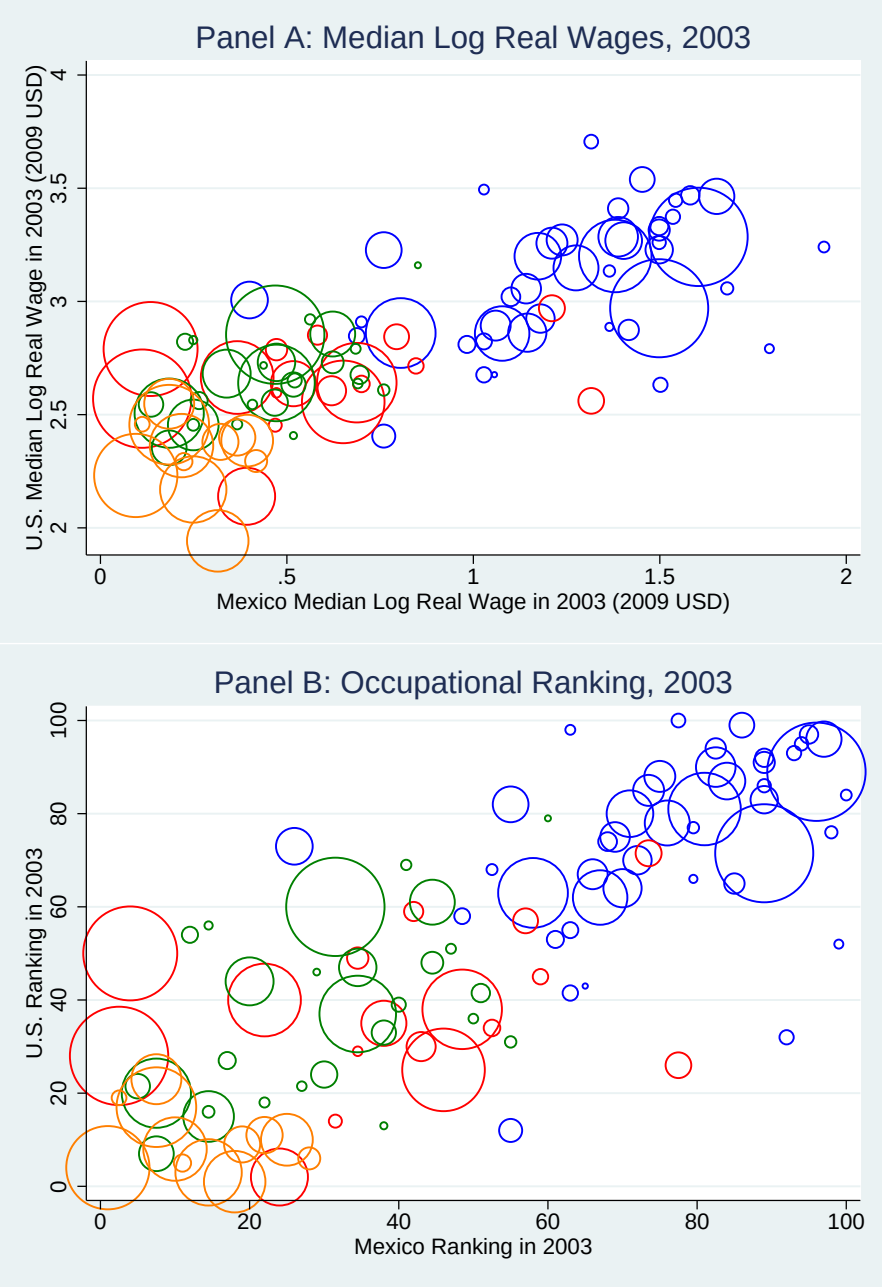


Note: Change in employment shares based on Mexican ENEU and ENOE data

Figure 6: Changes in Employment Shares for 12 Occupation Groups, 2003–2011

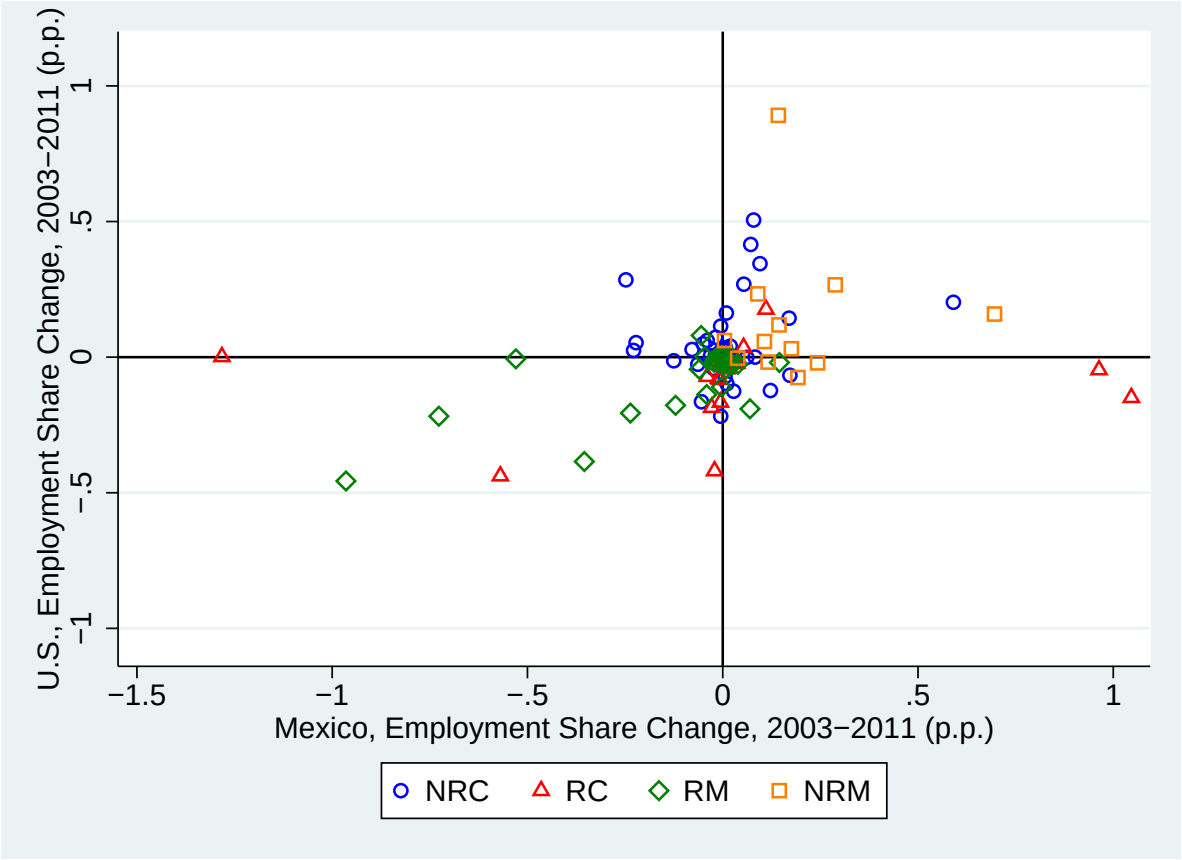
Note: Change in employment shares based on U.S. CPS and Mexican ENEU and ENOE data. For details of the mapping of occupation codes to these 12 categories, see Appendix Tables A.1 and A.2.

Figure 7: Occupational Wages in the U.S. and Mexico



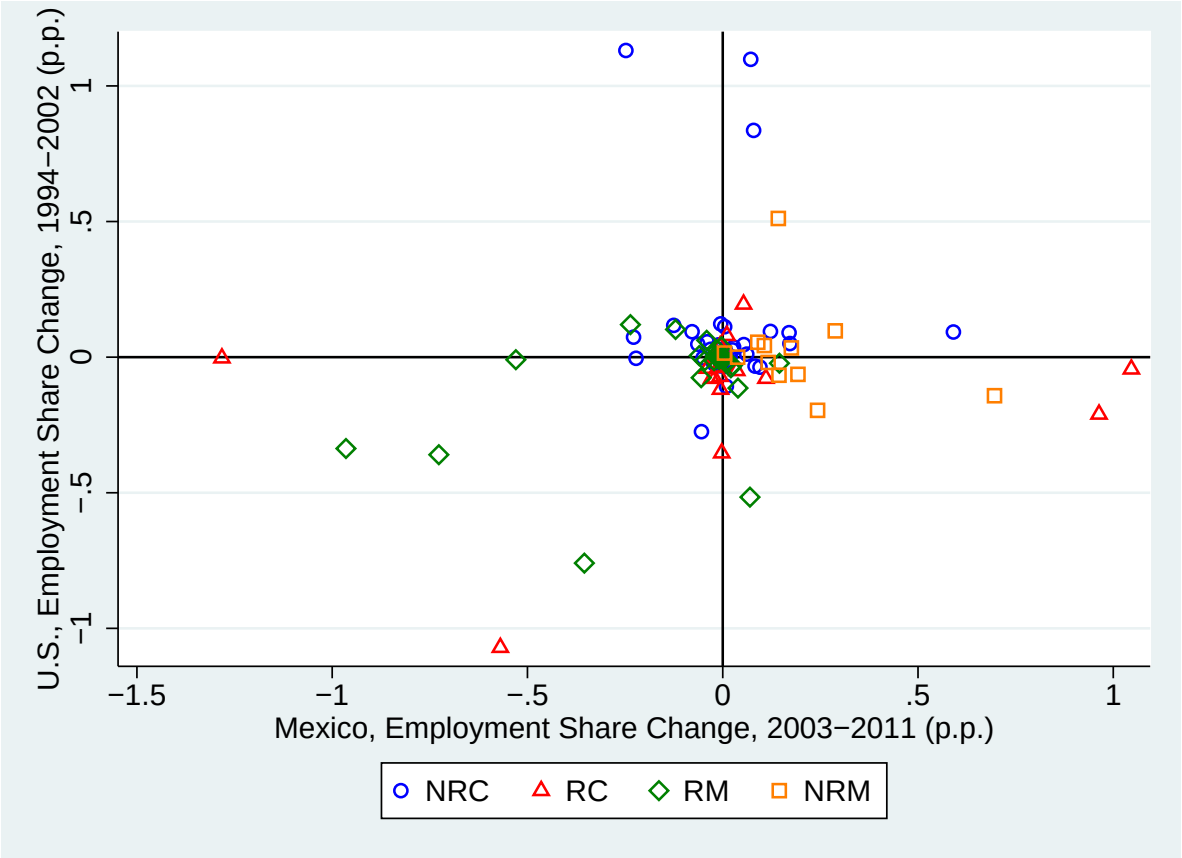
Note: Wages computed from U.S. CPS and Mexican ENEU and ENOE data. The size of each circle corresponds to the average of the occupation's share of aggregate employment in the US and Mexico. The color of each circle indicates the broad occupational group that the occupation belongs to: blue for Non-Routine Cognitive, red for Routine Cognitive, green for Routine Manual and orange for Non-Routine Manual.

Figure 8: Change in Occupational Employment Shares in the U.S. and Mexico



Note: Employment shares computed from U.S. CPS and Mexican ENEU and ENOE data. Blue circles correspond to Non-Routine Cognitive occupations, red triangles to Routine Cognitive ones, green diamonds to Routine Manual ones, and orange squares to Non-Routine Manual ones.

Figure 9: Change in Occupational Employment Shares in the U.S. and Mexico



Note: Employment shares computed from U.S. CPS and Mexican ENEU and ENOE data. Blue circles correspond to Non-Routine Cognitive occupations, red triangles to Routine Cognitive ones, green diamonds to Routine Manual ones, and orange squares to Non-Routine Manual ones.

Table 1: Descriptive Statistics for Employed Workers

	U.S.		**Mexico**	
	2000	2015	2000	2015
Average Age	38.56	40.74	34.68	37.89
Fraction Female	46.90	47.20	37.36	41.21
Average Real Wage (2009 USD)	20.46	22.43	2.21	2.05
Manufacturing Share of Emp	15.11	10.49	23.69	18.69
Educational Composition:				
Elementary Education or Less	1.90	1.65	40.87	24.67
Middle School	9.22	5.68	25.33	32.60
High School	61.04	56.86	17.25	23.29
College Education or Higher	27.84	35.81	16.55	19.44
Nr of Observations (Unweighted)	687,681	688,316	593,657	569,918

Note: Summary statistics based on U.S. CPS and Mexican ENEU and ENOE data.

Table 2: Occupations with largest changes in employment shares in the U.S., 2003–2011

Panel A: Occupations with the largest declines in employment shares in the U.S.			
		Change in Emp Share (p.p.)	
	Group	U.S.	Mexico
Production Related Occupations	RM	-0.457	-0.965
Secretary	RC	-0.438	-0.569
Merchant at a commercial establishment	RC	-0.419	-0.021
Other Machine Operators n.e.c	RM	-0.385	-0.354
Winding and twisting textile and apparel operatives	RM	-0.218	-0.727
Construction inspectors	NRC	-0.218	-0.005
Carpenters	RM	-0.206	-0.236
Production, Installation and Maintenance Laborers	RM	-0.191	0.070
Data entry keyers	RC	-0.186	-0.028
Transportation and Material Moving Occupations	RM	-0.178	-0.121
Typists	RC	-0.166	-0.006
Production supervisors or foremen	NRC	-0.164	-0.054
Panel B: Occupations with the largest increases in employment shares in the U.S.			
		Change in Emp Share (p.p.)	
	Group	U.S.	Mexico
Other type of food cook, waiter, or flight attendant	NRM	0.159	0.696
Engineers and scientists	NRC	0.163	0.009
Cashiers	RC	0.177	0.111
Technicians	NRC	0.202	0.591
Security professionals and related worker	NRM	0.233	0.090
Food Preparation or related worker	NRM	0.267	0.288
Registered nurses	NRC	0.269	0.054
Managers and administrators n.e.c.	NRC	0.285	-0.248
Other managers/coordinators n.e.c	NRC	0.345	0.095
Other professionals n.e.c	NRC	0.416	0.072
Other Teachers	NRC	0.506	0.079
Personal service occupations, n.e.c	NRM	0.891	0.142

Note: Changes in employment shares based on U.S. CPS and Mexican ENEU and ENOE data.

Appendix

Table A.1: Crosswalk Part 1

occ_cm	Occupation Description	CMO Codes	SINCO Codes	occ1990dd Codes
1	Accountants and auditors	1172	2121	23
2	Actors, directors, and producers	1413	2175	187
3	Architects	1100	2263	43
4	Chemical engineers	1104	2251	48
5	Chemists	1120	2222	73
6	Civil engineers	1101	2261	53
7	Dancers	1414	2174	193
8	Dentists	1132	2413	85, 204
9	Economists, market and survey researchers	1170	2123	166
10	Electrical engineers	1105	2241, 2642	55
11	Insurance adjusters, examiners, and investigators	7134	4222	24, 253, 375
12	Lawyers/Legal assistants and paralegals	1160	2135	178, 234
13	Librarians	1174	2144	164, 329
14	Registered nurses	1131	2426, 2811	95, 207
15	Dieticians and nutritionists	1134	2423	97
16	Editors and reporters	1401	2152	195, 228, 349
17	Geologists and Miners	1102, 1103	2254, 2262	75, 598, 614, 616, 617
18	Painters, sculptors, craft-artists, and print-makers	1420, 1421	2161, 2163	188, 789
19	Pharmacists	1121	2428	96
20	Physicians	1130, 1139	2411, 2412	84, 106
21	Psychologists	1164	2142	167
22	Surveyors, cartographers, mapping scientists/techs	6232	3231	218
23	Veterinarians	1151	2232	86
24	Other professionals i.e.	1119, 1133, 1135, 1142, 1159, 1161, 1162, 1163, 1165, 1166, 1167, 1169, 1171, 1173, 1175, 1179, 1180, 1190, 2100	1111, 1112, 2111, 2112, 2113, 2122, 2131, 2132, 2133, 2141, 2143, 2153, 2271, 2272, 2281, 2311, 2312, 2422, 2424, 2425, 2427, 2523, 2524, 2542, 2623, 2624, 2625, 2634, 2636, 2638, 2639, 2644, 2646, 2711, 2824, 2826, 2991	25, 26, 27, 64, 65, 66, 87, 88, 98, 104, 169, 173, 176, 189, 198, 226, 227, 229, 384, 386, 467, 575, 774
25	Other type of art performer	1400, 1419, 1423, 1429, 1430, 1431, 1432	2151, 2162, 2164, 2541, 2543, 2544, 2551, 2655, 2712	165, 183, 184, 185, 217, 645, 649, 684
26	Engineers and scientists	1106, 1109, 1110, 1111, 1129, 1140, 1141, 1149, 1150, 1152, 1153, 1168	2134, 2211, 2212, 2221, 2223, 2231, 2242, 2252, 2253, 2421, 2611, 2612, 2613, 2621, 2622	44, 45, 47, 56, 57, 59, 68, 69, 74, 76, 77, 78, 79, 83, 258, 829, 844
27	Other Teachers	1300, 1310, 1320, 1330, 1331, 1332, 1340, 1350, 1351, 1352, 1353, 1354, 1359, 1360, 1361, 1362, 1363, 1364, 1369, 1390	2321, 2322, 2331, 2332, 2333, 2334, 2335, 2339, 2341, 2342, 2343, 2391, 2713, 2714, 2715	154, 155, 156, 157, 158, 159, 163, 387
28	Assistant (mining or wells)	5410	9211	873
29	Assistant (construction)	5460	9221	865
30	Musician	1410, 1411, 1412, 1422, 1439	2171, 2172, 2173, 2552	186

Crosswalk Part 2

occ_cm	Occupation Description	CMO Codes	SINCO Codes	occ1990dd Codes
31	Sportsman	1440, 1450, 1451, 1460	2561, 2562, 2563, 2716, 9713	199
32	Arts/Cultural Performer	1461, 1469, 1490	2553	194
33	Coordinator or supervisor (human resources)	6111	1511	8
34	Coordinator or supervisor (financial services)	6110	1512	7
35	Coordinator or supervisor (transports)	6121	1623	803
36	Managers in education and related fields	6101, 6132	1523	14
37	Supervisors of food preparation and service	5100, 5109	7501	433
38	Managers of medicine and health occupations	2120, 6100, 6109	1221, 1521	15
39	Managers and administrators i.e..	2019, 2101, 2110, 2111, 2119, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2139, 2190	1113, 1121, 1122, 1129, 1131, 1132, 1133, 1134, 1135, 1211, 1212, 1222, 1223, 1224, 1226, 1311, 1312, 1313, 1314, 1315, 1321, 1322, 1323, 1324, 1411, 1412, 1421, 1422, 1423	4, 13, 18, 22, 28, 29, 33
40	Construction inspectors	5160, 5169	1615, 7101	35, 558
41	Production supervisors or foremen	5120, 5129, 5130, 5139, 5140, 5149, 5150, 5159	1614, 7201, 7301, 7401, 7601	628
42	Inspectors and compliance officers, outside	5101, 5111, 5121, 5131, 5141, 5151, 5161, 5171, 5181	2630, 2640, 3101	36, 361, 489
43	Other managers/coordinators i.e.	5110, 5119, 5170, 5179, 5180, 5189, 5190, 5540, 6102, 6120, 6130, 6131, 6133, 6139, 6140, 6150, 6160, 6170, 6180, 6190	1522, 1524, 1525, 1526, 1611, 1612, 1613, 1619, 1621, 1622, 1624, 1629, 1711, 1712, 1721, 1722, 1723, 1999, 3142, 8101, 8201, 8301	19, 303, 415, 448, 450, 470, 475, 503
44	Technicians	1200, 1201, 1202, 1203, 1204, 1205, 1206, 1209, 1210, 1211, 1219, 1220, 1221, 1222, 1223, 1229, 1230, 1231, 1232, 1239, 1240, 1241, 1242, 1243, 1249, 1250, 1251, 1252, 1260, 1290	2631, 2633, 2635, 2637, 2641, 2643, 2645, 2649, 2651, 2652, 2653, 2654, 2812, 2813, 2814, 2815, 2816, 2817, 2825, 2992	203, 205, 206, 208, 214, 223, 224, 225, 235, 678
45	Cashiers	6210	3121	276
46	Real estate sales occupations	7132	4223	254
47	Merchant at a commercial in establishment	7100	4111	243
48	Transportation ticket and reservation agents	6231, 6239	3221, 3222	318
49	Receptionist	6211, 6230	3211, 3212	376
50	Salespersons i.e.	7111, 7131, 7135, 7139	2514, 4211, 4213, 4214, 4221, 4224	256, 274, 275, 283
51	Financial service sales occupations	7133, 7190	4201	255, 383
52	Interviewers, enumerators, and surveyors	6249, 6260, 7110, 7120, 7121, 7130, 7210, 8140	3141, 4212, 4231, 4232, 4233, 4311, 4312, 4999, 9712	316, 359
53	Data entry keyers	6202	3113	385
54	Mail and paper handlers	6220	3131	326, 346, 354, 357
55	Mail carriers for postal service	6250	9721	355, 356
56	Secretary	6200, 6209	3111, 3115	37, 313, 319, 736
57	Telephone operators	6240	3213	348
58	Office machine operators, i.e..	6203	3114	347
59	Administrative support jobs, i.e..	6290	3999	389
60	Other Admin Support Occupations i.e.	6219, 6221, 6229, 6241, 6251, 6259, 6270	2511, 2512, 2531, 3122, 3132, 3232, 9711, 9722, 9723, 9731, 9732	34, 317, 328, 335, 336, 337, 338, 344, 364, 365, 377, 378, 379

Crosswalk Part 3

occ_cm	Occupation Description	CMO Codes	SINCO Codes	occ1990dd Codes
61	Typists	6201	3112	315
62	Locksmiths and safe repairers	5244	7222	536
63	Shoemakers, other prec. apparel and fabric workers	5227	7353	669
64	Mechanics	5245	2632	505, 507, 508, 516, 534, 549
65	Carpenters	5230	7123, 7311	567
66	Cementing and gluing machine operators	5251	7612	588, 753
67	Glaziers	5252	7613	589
68	Hand molders and shapers, except jewelers	5240	7211	675
69	Painters, construction and maintenance	5261	7135	579
70	Masons, tilers, and carpet installers	5262	7131	563, 584
71	Roofers and slaters	5263	7122	595
72	Dressmakers, seamstresses, and tailors	5222	7341	666
73	Welders, solderers, and metal cutters	5241	7212	783
74	Miscellaneous industry worker	5210, 5221, 5223, 5224, 5225, 5226, 5229, 5231, 5231, 5232, 5239, 5242, 5243, 5246, 5247, 5248, 5249, 5250, 5253, 5259, 5260, 5264, 5265, 5266, 5267, 5269, 5270, 5271, 5272, 5279, 5280, 5290, 5400, 5420, 5430, 5440, 5450, 5470, 5480, 5490	7111, 7112, 7113, 7121, 7132, 7133, 7134, 7213, 7221, 7223, 7312, 7313, 7321, 7332, 7342, 7343, 7344, 7351, 7352, 7411, 7611, 7614, 7999, 9124, 9212, 9222, 9231, 9232, 9233, 9234, 9235, 9236, 9237, 9239, 9899	233, 366, 368, 373, 471, 509, 514, 518, 519, 523, 525, 526, 527, 533, 535, 539, 543, 544, 573, 577, 583, 585, 597, 599, 615, 634, 637, 643, 644, 653, 657, 658, 668, 677, 679, 686, 707, 723, 799, 823
75	Production, Installation and Maintenance Laborers	5200, 5201, 5202, 5203, 5204, 5205, 5206, 5207, 5211, 5220, 5228, 5233, 5234, 5281, 5401, 5411, 5421, 5431, 5441, 5451, 5461, 5481, 5491	7214, 7322, 7323, 7331, 7412, 7511, 7512, 7513, 7514, 7515, 7516, 7517, 8211, 8212	593, 709, 754, 785, 859, 869, 888, 889
76	Shoemaking machine operators	5323	8154	745
77	Winding and twisting textile and apparel operatives	5320, 5322, 5324, 5329	8151, 8153, 8155	738, 739, 743, 744, 747, 749
78	Wood Machine Operator	5330, 5332, 5339	8141, 8142	729, 733
79	Power plant operators	5370, 5379	8181	695
80	Water and sewage treatment plant operators	5312, 5380	8113, 8134	694
81	Paper folding machine operators	5331, 5334	8143, 8145	765
82	Drilling and boring machine operators	5310, 5311, 5319	8111, 8112	708, 755, 853
83	Molders and casting machine operators	5340, 5341, 5342, 5343, 5344, 5349	8121, 8122, 8123	719
84	Slicing, cutting, crushing and grinding machine	5300, 5301, 5302, 5303, 5304, 5305, 5306	8162, 8163	769
85	Other Machine Operators i.e.	5307, 5309, 5321, 5333, 5335, 5345, 5350, 5351, 5352, 5353, 5359, 5360, 5371, 5381, 5382, 5383, 5389, 5390, 5541	8114, 8131, 8132, 8133, 8135, 8144, 8152, 8161, 8171, 8172, 8173, 8199	308, 594, 696, 699, 703, 706, 713, 724, 727, 734, 756, 757, 764, 766, 779, 824, 825, 848, 878

Crosswalk Part 4

occ_cm	Occupation Description	CMO Codes	SINCO Codes	occ1990dd Codes
86	Transportation and Material Moving Occupations	5500, 5501, 5502, 5509, 5510, 5511, 5520, 5521, 5522, 5529, 5530, 5542, 5543, 5549, 5550, 5551, 5590	2661, 2662, 8311, 8321, 8322, 8323, 8324, 8331, 8341, 8342, 8343, 8344, 8349, 8351, 8352, 8999, 9311, 9312, 9321, 9322	804, 808, 809, 834
87	Baggage porters, bellhops and concierges	8123	9623	464
88	Janitors	8124	9621	453
89	Fire fighting, fire prevention, and fire inspection	8300	5311	417
90	Police and detectives, public service	8301, 8302	2521, 5312	418
91	Security professionals and related worker	8303, 8304, 8309, 8312, 8390	2513, 2522, 2532, 5301, 5313, 5313, 5314, 5314, 5999, 5999	423, 425, 426, 427, 461
92	Hairdressers and cosmetologists	8130	5211	457, 458
93	Other type of food cook, waiter, or flight attendant	8100, 8101, 8109	5115, 5116	435
94	Gardeners and groundskeepers	8125, 8203	5241, 5242, 9651	451
95	Domestic Services	8200, 8201, 8202, 8204, 8209	5201, 5221, 5222, 9601, 9611, 9622, 9733	405, 468
96	Housekeepers, maids, butlers, and cleaners	8110, 8111, 8119	9641, 9642, 9643	408
97	Laundry and dry cleaning workers	8131, 8132, 8139, 8151, 8190	3201, 5212, 5213	469
98	Personal service occupations, i.e.	7200, 7211, 7212, 7213, 7219, 8102, 8120, 8121, 8122, 8126, 8129, 8150, 8152, 8159, 8160	2145, 2233, 2234, 2533, 2614, 2821, 2822, 2823, 2827, 5231, 5251, 5252, 5253, 5254, 9331, 9332, 9624, 9631, 9632, 9633, 9634, 9661, 9662, 9663	89, 99, 103, 105, 174, 177, 434, 445, 447, 455, 459, 462, 466, 472, 813, 866, 875, 885, 887
99	Door-to-door sales, street sales, and news vendors	7201, 7209, 7290	9511, 9512, 9521	277
100	Food Preparation or related worker	5208, 5209	5101, 5111, 5112, 5113, 5114, 9411	436, 439, 444, 687, 688, 763
101	Agriculture/Military	4100, 4101, 4102, 4103, 4104, 4105, 4106, 4107, 4108, 4109, 4110, 4111, 4112, 4113, 4114, 4115, 4116, 4119, 4120, 4130, 4131, 4132, 4133, 4134, 4135, 4136, 4139, 4140, 4141, 4150, 4159, 4170, 4190, 8303, 8304, 8309, 8310, 8311, 8312, 8390	1225, 5401, 5411, 5412, 5413, 6101, 6111, 6112, 6113, 6114, 6115, 6116, 6117, 6119, 6121, 6122, 6123, 6124, 6125, 6126, 6127, 6128, 6129, 6131, 6201, 6211, 6212, 6213, 6221, 6222, 6223, 6224, 6225, 6226, 6227, 6231, 6311, 6999, 9111, 9112, 9113, 9121, 9122, 9123	473, 479, 488, 496, 498

Source: ENEU, ENOE and CPS.

Table A.2: Grouping of Occupations

Occupation Group	Occupation Codes (occ_cm)
Non-Routine Cognitive (NRC)	
Management Related Occupations	1 – 27, 30 – 32
Professional Specialty Occupations	33 – 43, 89 – 90
Technicians and Related Support Occupations	44
Routine Cognitive (RC)	
Sales Occupations	45 – 52
Administrative Support Occupations	53 – 61
Routine Manual (RM)	
Mechanics and Repairers	62 – 64, 74
Production and Construction Related Occupations	28, 29, 65 – 75
Machine Operators, Assemblers, and Inspectors	76 – 85
Transportation and Material Moving Occupations	86
Non-Routine Manual (NRM)	
Housekeeping and Cleaning Occupations	87, 88
Protective Service Occupations	91
Other Service Occupations	92 – 100

Table A.3: Occupations with major differences in wage rankings in the U.S. and Mexico, 2003

Panel A: Occupations ranked at least 25 positions higher in the U.S.

	Group	U.S. Rank (out of 100 occupations)	Mexico Rank (out of 100 occupations)	U.S. Employment Share	MX Employment Share
Salespersons n.e.c.	RC	28	3	4.40	5.59
Merchant at a commercial establishment	RC	50	4	3.50	5.63
Cementing and gluing machine operators	RM	54	12	0.10	0.31
Glaziers	RM	56	15	0.04	0.07
Production Related Occupations	RM	60	32	4.44	10.80
Water and sewage treatment plant operators	RM	69	41	0.05	0.12
Police and detectives, public service	NRC	73	26	0.64	0.86
Inspectors and compliance officers	NRC	82	55	0.11	1.32
Veterinarians	NRC	98	63	0.04	0.07

Panel B: Occupations ranked at least 25 positions higher in Mexico

	Group	U.S. Rank (out of 100 occupations)	Mexico Rank (out of 100 occupations)	U.S. Employment Share	MX Employment Share
Supervisors of food preparation and service	NRC	12	55	0.50	0.10
Financial service sales occupations	RC	26	78	0.58	0.10
Sports player and related	NRC	32	92	0.16	0.07
Arts/Cultural Performer	NRC	52	99	0.08	0.01

Note: Rankings correspond to the occupation's position across the 100 occ_cm occupations based on median wages (with lower numbers corresponding to lower paying occupations within the respective country). Wages and employment shares based on U.S. CPS and Mexican ENEU and ENOE data.